

FOREST CONTROL

by CONTINUOUS INVENTORY

"Today I have grown taller from walking
with the trees."

...Karle Wilson

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"Things Look Very Differently in the Forest.
From What They Do in Books"

"Thirty years ago, I prided myself on knowing science well. Had I not grown up with it and in addition had learned it in the universities? Since then I have not lacked the opportunity for increasing my knowledge in many directions, but during this long period I have come to see very clearly how little I know of the depths of the science, and to learn that this science has by no means reached that point which many believe to have been passed.

Many perhaps may be in the condition in which I was 30 years ago; may they in the same manner be cured of their conceit! Forestry is based on the knowledge of nature; the deeper we penetrate its secrets, the deeper the depths before us. What the light of any oil lamp makes visible is easily overlooked; many more things we can see by torch light, but infinitely more in the sunlight. The lighter it grows around is, the more unknown things become apparent, and it is a sure sign of shallowness, if anybody believes he knows it all.

Our foresters can still be divided into empiricists and scientists, rarely are both united.

What the former considers sufficient in a forest management is easily learned, and the systematic teachings of the other are soon memorized. But in practice the art of the first stands to a thorough forestry science in the same relation as the quack medicine to the true pharmacopoeia; and the other often does not know the forest for the many trees. Things look very differently in the forest from what they do in books; the learned man stands, therefore, frequently left by his learning and at the same time without the bold decision of the empiricist."

HEINRICH COTTA, The Elder

"Anweisung zum Waldbau" 1817



WEIGHTED TREE VIGOR GRADING RULES FOR CFI

It is important to classify and record the health of trees when cruising timber for forest management purposes. To aid this practice, the application of numerical weights to each important characteristics influencing tree health has been found practicable. Accumulated as the tree is examined in the woods, tree vigor weights in final summation help to define the wood producing power of trees in place. Weighted tree vigor grading rules have a wide range of uses and advantages.

1. They segregate forest trees into 5 increment classes for study.
2. They provide a sound gauge of the condition of the forest.
3. They help to guide decisions on the allowable cut.
4. They aid in classification of the management potential of trees.
5. They encourage thoughtful examination of tree condition by cruisers.
6. They are training tools for less specific flash vigor grading methods.
7. They help the checker tie down cruisers' errors of judgment.
8. They have undoubted advantages in research.
9. They pinpoint reasons for change in tree vigor over the years.

THE TIME IT TAKES FOR WEIGHTED TREE VIGOR GRADING

Weighted tree vigor grading takes about twice the time required for flash vigor grading, or almost one minute per tree. This time varies with the speed of the cruiser, the storage capacity of his memory units, and the proportion of trees obviously of the poorest vigor classes. Generally 80% to 90% of the trees require an orderly examination of the judging points, and a final summation of the related weights. The entire process is similar to flash grading but more detailed and explicit.

THE FIELD PROCEDURE FOR WEIGHTED TREE VIGOR GRADING

Weighted tree vigor grading separates trees into 5 classes. Each tree is diagnosed by a sequential examination of crown class, crown size, crown density, bole form, rot or decay and risk of mortality. Summed up mentally in the course of the examination, the final accumulated numerical value establishes the vigor class of the tree. The range of allowable values for each of the 6 tree characteristics is easily memorized.

NUMERICAL RANGE OF VALUES FOR WEIGHTED TREE VIGOR GRADING

<u>Vigor Class</u>	<u>Numerical Range of the Sum of the Vigor Weights</u>
1. Very good	6, 7, 8
2. Good	9, 10, 11, 12, 13
3. Fair	14, 15, 16, 17, 18, 19, 20
5. Poor	21, 22, 23, 24, 25, 26, 27
6. Very poor	28 and up
4. Cull	Less than 40% or 50% sound

There are 24 numerical weights to remember. In contrast with the lumber grader and his multitudes of grades and sorts, the cruiser's task of remembering only 24 vigor weights presents little problem.

<u>Tree Characteristics</u>	<u>Numerical Weights for Each Degree of Difference in Tree Condition</u>				
	<u>Very good</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>Very poor</u>
	<u>V-1</u>	<u>V-2</u>	<u>V-3</u>	<u>V-5</u>	<u>V-6</u>
Crown class	1	2	4	6	10
Crown size	1	2	4	15	18
Crown density	1	-	6	-	11
Bole form	1	-	6	-	15
Rot or decay	1	3	6	12	20
Mortality risk	1	-	10	-	25

THE GUIDE CHART FOR WEIGHTED VIGOR GRADING

Descriptive rules for each qualifying tree characteristic are given in a one-page chart. Corresponding weights are also listed. Since it is time consuming to constantly refer to the chart, the rules and weights should be learned by rote. The guide chart, reduced to pocket size and plasti-coated, is a useful woods reference.

Here again, as in flash vigor grading, trees of unusually poor vigor are often obvious at a glance. For such trees it is unnecessary to run through every detail of the chart, or to sum up the weights. Separately or in combination, these factors always indicate the poorest vigor classes:

1. Badly suppressed trees which are not free to grow.
2. Trees with less than one-quarter crown.
3. Trees sub-merchantable in length with no possibility of growing taller.
4. Trees with 35% or more rot or decay in the usable length.
5. Trees of obviously high risk.

GRADING TREE VIGOR BY WEIGHTED RULES

PROGRESSIVES			INTERMEDIARIES	REGRESSIVES	
VIGOR CHARACTERISTICS	VERY GOOD TO GOOD GROWING STOCK		FAIR GROWING STOCK	POOR TO VERY POOR GROWING STOCK	
	VIGOR 1	VIGOR 2	VIGOR 3	VIGOR 5	VIGOR 6
CROWN CLASS	Dominant Head dominant	Dominant Codominant	Codominant High intermediate Free to grow if overtopped.	Intermediate Low intermediate Overtopped Seldom free to grow	Suppressed Not free to grow Completely regressive <u>Always Vigor 6</u>
CROWN SIZE	In hardwoods, a 4/4 or full crown in circumference and radius. In conifers, a very good ratio of green crown length to total tree height.	In hardwoods, a 3/4 to 4/4 full crown in circumference and radius. In conifers, a good ratio of green crown length to total tree height.	In hardwoods, a 1/2 to 3/4 full crown in circumference and radius. In conifers, a fair ratio of green crown length to total tree height.	In hardwoods, a 1/4 to 1/2 full crown in circumference and radius. In conifers, a poor ratio of green crown length to total tree height.	In hardwoods, a 1/4 full crown or less. <u>Always Vigor 6</u> In conifers, a very poor ratio of green crown length to total tree height. <u>Always Vigor 6</u>
CROWN DENSITY LEAF CONDITION	Full silhouette and good crown density with an occasional dead branch in the outer crown. Leaf size and color normal. Permits natural pruning. No large limb stubs on bole.		Fair crown density Some dead branches in outer crown. Leaf size and color fair. Dead limb stubs on upper bole.	Open silhouette and poor to very poor crown density. Many dead limbs in the outer crown. Top die-back often present. Leaves small and poor color. Branch stubs common on upper and middle bole. <u>Always Vigor 6</u> when oak wilt or Dutch elm disease evident.	
✓ LENGTH FORM	No large forks or usable length stoppers Good form quotient. Sawlog or pulpwood lengths commensurate with the site on which tree is growing.		Usable length stoppers may occur on upper bole. Fair form quotient. Site and usable length correlation fair to good.	Large low forks often limit usable lengths Often a poor form quotient. Heavy taper. Pulpwood or sawlog lengths below average for site. Trees permanently submerchantable in length are <u>Always Vigor 6 or cull.</u>	
Usable lengths far short of average for the site reduce tree vigor by one class					
ROT AND DECAY WITHIN THE USABLE LENGTH	Not more than 3% to 7% cull loss. Soundness class 93% or 97%. One or two minor cull defects on upper bole. No heart rot Sound burls Crook or sweep will cut out.	Not more than 7% cull loss. Soundness class 93% or 97%. Several minor cull defects. Occasionally one major on upper bole. Slight heart rot in stump. Sound burls Crook or sweep will cut out.	Not more than 14% cull loss. Soundness class 86%, 93% or 97%. Many minor or one major cull defects on middle or lower bole. Moderate heart rot present. Unsound burls Moderate deductable sweep or crook.	Not more than 22% cull loss. Soundness class 78%, 86%, 93% or 97%. One to two major cull defects or equivalent, often on lower bole. Severe heart rot present. Rotted burls Crook or sweep loss heavy. 22% loss due to rot is <u>Always Vigor 5.</u>	Cull loss up to 35% to 50%. Soundness class 50%, 65%, 78%, 86%, 93%, or 97%. Two or more major cull defects or equivalent on lower bole. Severe heart rot is present. Rotted burls Very heavy crook or sweep loss. 35% - 50% loss due to rot is <u>Always Vigor 6.</u>
RISK OF MORTALITY IN NATURAL FORESTS OR IN STANDS AFTER MODERATE PARTIAL CUTS	Roots firm. No risk of loss due to windfall or main stem breakage. Bole sound. Strong, tight forks. Foliage in good condition. No epidemic disease or insect damage apparent.		Combinations of weak forks, die-back, heart rot, leaf discoloration and root damage causing moderate to serious risk of loss in 10 - 15 years.	Root sprung. Heavy risk of loss. Weak butter churn butts. Large, high, weak forks. Excessive die-back. Epidemic disease or insect damage apparent. Mortality anticipated within 5 - 10 years. Heavy risk is <u>Always Vigor 5 or 6.</u>	
SPECIAL NOTES	Cull trees (Vigor 4) are less than 40% or 50% sound. Decisions on tree vigor must not be influenced by soil, site, topography, physical features, or other factors outside of the tree itself.				

VIGOR AND GROWTH CORRELATIONS JUSTIFY AND ENCOURAGE WEIGHTED VIGOR GRADING

The tables inserted into the script show growth results for a 17-year period. The trees included are in the 11.0" to 14.9" diameter range, and each tree was vigor graded four different times during the period.

Net Scribner Board Foot Growth of
12" and 14" Trees - All Species
17-year Period 1945 - 1962

Weighted Vigor Classes	No. of Trees	% of Trees	Bd. Ft. Growth	% of Bd. Ft. Growth
1. Very good	214	15.1	632.3	24.1
2. Good	282	19.9	747.2	28.5
3. Fair	281	19.8	723.8	27.6
Total	777	54.8	2,103.3	80.2
5. Poor	261	18.4	323.5	12.3
6. Very poor	380	26.8	197.5	7.5
Total	641	45.2	521.0	19.8
Total	1,418	100.0	2,624.3	100.0

From these records it is apparent that 54.8% or 777 of the trees produced 80.2% of the net Scribner board foot growth in 17 years. These trees were average and above average in weighted vigor. Below average vigor classes comprised 641 trees contributing only 19.8% of the board foot growth in the same period.

Trees below average vigor have little place in a managed forest. Unfortunately Lake States timber stands are over-burdened with such trees and it is going to take a long time and most intensive forest management practices to materially improve this situation. Their removal in one cut is impossible and often undesirable.

Per Tree and Per Acre Board Foot Growth
12" and 14" Trees - All Species
17-Year Period - 1945-1962

Weighted Vigor Class	Growth Per Tree		Bd. Ft. Growth	
	Bd. Ft.	Basal Area	Per Acre	
1. Very good	2.95	.018	9.3	
2. Good	2.65	.019	11.0	
3. Fair	2.58	.017	10.6	
Vigors 1, 2 and 3	Ave. 2.71	Ave. .018	Total 30.9	
5. Poor	1.24	.013	4.8	
6. Very poor	0.52	.010	2.9	
Vigors 5 and 6	Ave. 0.81	Ave. .011	Total 7.7	

The need of this particular forest for sanitation and rejuvenation is acute. Fewer and fewer trees have remained productive over the years. Rot is increasing in the low vigor classes, and Vigor 2 trees have moved into Vigor Class 3. Mortality has been heavy in Vigor 6.

Growth Relationships - 12" and 14" Trees

In the first	5 years	50.5% of the trees	grew 68.2% of the board feet
In the second	5 years	54.0% of the trees	grew 83.1% of the board feet
In the third	5 years	56.9% of the trees	grew 86.2% of the board feet
In the last	2 years	59.9% of the trees	grew 89.1% of the board feet

Graphic pictures of the growth relationships effectively sum up these data and point once again to the need for drastic stand improvement measures through some form of partial cutting in this northern hardwood - mixed oak forest near Milwaukee, Wisconsin.

CAL STOTT

Forester

U. S. Forest Service, Region 9

WEIGHTED VIGOR GROWTH CORRELATIONS IN PERCENT OF TREES, BASAL AREA AND NET SCRIBNER BOARD FEET 12 AND 14 INCH D.B.H. CLASSES

